

A Compendium
SHORT COMPENDIUM
OF THE *Artillerist's*
DUTY OF ARTILLERISTS:

SHEWING THE METHOD OF
EXERCISE with LIGHT FIELDPIECES;
OF ASCERTAINING THE
TRUE LINE of DIRECTION
ELEVATION

Corresponding with the BORE of a GUN; with a Description of the INSTRUMENTS, for that Purpose.

ALSO,

AN EASY METHOD OF
FINDING the DISTANCE of an OBJECT, by a
PLAIN TABLE;

WITH ITS PARTICULAR DESCRIPTION.

ALSO,

OBSERVATIONS ON
EXPERIMENTAL GUNNERY.

By AMASA SMITH,

Major of ARTILLERY in the MILITIA of Massachusetts.

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Col. T. M. Spaulding
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Dedication.

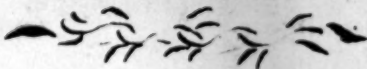
TO all ARTILLERISTS---All who
are desirous of being Artillerists, and to all
those who will take the trouble to read the
following pages, with attention and candor,
and wish to improve in the art for the sake
of being useful to their country and benefi-
cial to mankind, this small treatise is most
respectfully inscribed,

by their most obedient,

humble Servant,

The AUTHOR.

Dedication



MVP 2-12-41

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AMHERST, 5th May, 1860.

To Major AMASA SMITH.

SIR,

HAVING perused your manuscript "Compendium of the Duty of an Artillerist," we are of opinion that it is ingenious, and well calculated to promote the design; being a system, simple and concise, it will be very useful, especially to the Militia of this Commonwealth. We therefore recommend its publication. You ought not to indulge a delicacy or a diffidence in appearing as an Author; if any dislike it, let them publish a better system; and should it so happen, that an improved system is published, you will have the consolation of originating and furthering the desired object, which has been so long neglected. Probably your Compendium may comprise some things before mentioned by other Authors; yet we think those Authors want the simplicity and perspicuity of your system. Authors in general are so prolix in their descriptions and definitions, that the young student is rather perplexed than enlightened: Therefore we give yours the preference, as containing all that is necessary for Companies of Artillery, whether in the militia, or actual service.

E. MATOON, Jun.
ZEBINA MONTAGUE,
PARK HOLLAND.

Preface.

IN writing the following pages, the author, at first, had nothing more in view, than to throw together in a short comprehensive way, some practical principles, which he had acquired by conversing with experienced officers, and from his own observation, and which he thought might be useful to himself and some other officers, with whom he was immediately concerned. Having been, some time, an officer in the Artillery and finding no regular system of discipline or method of exercise, for field artillery, he set about forming one for himself, which was communicated to and practised by the officers under his command, who had applied to him for direction. And it is at their request, and that of several superior officers, to whom he feels himself under special obligations, he now consents to its publication; hoping it may, in some measure be useful to those who wish to improve in the art, and thereby be beneficial to their country. He has long thought, that a compendium of this kind would be of great use to the public, and has hoped to see one from some more skilful hand. Before he had fitted the following sheets for the press, the first Vol. of Steven's System, came to hand, which is acknowledged to be an ingenious work. But as he found it did not anticipate his present design; and as some things in this summary are perhaps new, it was thought advisable to proceed. Should the following compendium serve to elucidate the subject, or prove beneficial to the artillerist, the writer will be amply rewarded for the labor it has cost him. Wherein he has differed from Col. Stevens, or other writers, he hopes it will not be imputed to vanity, but to a desire to improve the art.

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INTRODUCTION.

NOTHING is more evident than that the use of cannon constitutes an essential part of the defence of a country. To improve in this art, therefore, at this day, is important; to neglect it, would be dangerous. Perhaps the most important and useful improvement that can now be made in Artillery, is that which is the most simple, plain, and easy to be understood; especially for those companies which form part of the militia; as they generally consist of men, who have but little leisure to acquire a thorough knowledge of those intricate mathematical calculations, which writers on artillery have generally gone into. The only advantage of theory is to assist in practice; therefore, the more simple the better. And perhaps in this case, a few practical rules, which may be easily understood by those who are not thoroughly acquainted with mathematics, may be of more immediate utility, than, by the higher principles of mathematics to describe the laws of resistance, and thereby determine the velocity of shots and shells, according to their projectile force; or, minutely to shew the curve described by the shot according to the different degrees of elevation, and so to compute the different horizontal ranges. For, the exact and expeditious applications of those principles, and the laws of projectiles are so intricate and difficult, that I believe, the most learned and experienced practitioner would be embarrassed, in applying

plying them to practice, in most cases, yet, it must be allowed, that the higher principles of mathematics ought to be attended to, by those who have a taste and leisure for those studies, and wish to be complete artillerists; more especially, as they may be very useful in mortar practice.

The following PRACTICAL RULES for Horizontal Ranges, are transcribed from MULLER'S Artillery.

- I. — "The range of a body projected with an angle of 15 degrees, is half the range of that body, if projected with the same force, with an angle of 45 degrees."
- II. — "The range of a body projected with an angle of 45 degrees is equal to the square of the time of its flight expressed in seconds multiplied by 16, 2 feet."
- III. — "If a body be projected with the same force, but with different angles of elevation, the horizontal ranges are, as the sines of the angles double those of their elevations respectively."
- IV. — "The times of the flights of the same body projected with the same force, with different degrees of elevation are to each other, as the sines of the angles of elevations."

But after all; the theory which is founded on or proved by experiment, is *that alone* which may be confided in, or successfully applied to the art of Gunnery. Therefore, to improve in this art, let experiments be made, and often repeated; let the elastic force of the powder be tried by firing a given quantity, with a ball that will just suit the bore of the Gun fixed at any given elevation; the greater the elevation the better, if under 45 degrees, *that being the elevation which produces the greatest possible horizontal range.*

Every ball or shell that is thrown, is acted upon by two forces; its projectile force, and that of its gravity; the former carrying it in a straight line, the latter inclining it to the center of the earth. Therefore in its *ascent* it will proceed with a *retarded motion*; and in its *descent*, with an *accelerated motion*.



A

COMPENDIUM of the DUTY
OF
ARTILLERISTS.

CHAPTER I.

Of the EXERCISE of FIELD ARTILLERY.

SECTION I.

Of PARADING a COMPANY of ARTILLERISTS.



ACCORDING to the present establishment, a Company of Artillerists consists of one Captain, two Lieutenants, four Sergeants, four Corporals, six Gunners, six Bombardiers, and thirtytwo Matrosses; therefore, I think it proper, for such* a company,
B to

* Were a Company to consist of *sixty four* Matrosses, it might be more proper to parade in two ranks, agreeably to Stevens' System.

to parade *rank entire* ; for in this way, it exhibits a more martial appearance, which is an important object in parading : This method of parading is also more convenient, as it serves to facilitate future operations and manœuvres. But should it be found more convenient, at any time, (when marching without pieces) for a Company to parade in *two ranks*, it is easy to bring one Rank into two, which may be done several ways ; but this I shall leave to the ingenuity of the Officers, and proceed invariably upon the principle of parading *rank entire*, in the following order, viz. in two equal Divisions, and each of those Divisions, in two Subdivisions, which Subdivisions, I shall term, *Platoons*. The Company should be sized, as far as may be, so as to place the tallest men on the right and left wings, and the shortest, in the center of each division—the Corporals, on the right and left wings of the two divisions—the Gunners and Bombardiers, in the center of each division—the Gunners, equally divided on the left of the first and third, and the Bombardiers on the right of the second and fourth platoons—the commissioned Officers in *front*, and the Sergeants in the *rear*, as is usual in the Infantry. But when the Company are to *wheel*, the Sergeants will take their places in the center of each division.

Nor.

NOTE.—This method of posting the Sergeants may appear odd to some ; but I think it preferable to any other ; as they will, thereby, be in a position to lead the files, when the Company march by files.

SECTION II.

ARTICLE I.

Of WHEELING and MARCHING by PLATOONS.

Caution.

Take care to Wheel by Platoons ;

The Sergeants take post, as before described.

Platoons ! to the right—Wheel ! March !

At this word of command, the platoons wheel to the right, and dress by the left ; taking care, not to open their ranks, but keep them closed. When the left wings have gained a quarter circle, and cover each other, they will cease to advance, but keep their step, on the ground.

Halt !—Dress !

The Sergeants should now divide their respective platoons into sections of four, (if not done before) or, if more convenient, divide each platoon into two equal sections.

And

And in marching, the men should be taught to break off by sections, and form platoons, for the sake of greater convenience, in marching, where the roads are narrow, and in passing defiles.

Attention !

Forward—March !

The whole advance, observing to keep step with the music. The Sergeants take care, that the platoons observe the same distances, with which they set off ; unless otherwise ordered.

ARTICLE II.

Of breaking off by Sections, and forming Platoons.

Caution.

*Take care to break off by Sections !
Or sections of four (as the case may be.)*

The men continue their march, as before ; but give good attention to the Officer, so as to be ready to break off, when the word is given.

Sections ! break off !

At this word of command, the sections on the right of each platoon march obliquely

a little to the left ; those on the left will break off, by shortening their step, and march obliquely to the right, until they cover the right section in their rear. But, if the *officer* sees it most convenient, for the sections to break off by the right, and form by the left, his word of *Caution* will be,

*From the right—take care to break off by
Sections !*

This movement is performed like the other ; only, the oblique step is the reverse. When the ground will admit, and the Officer thinks best to march by platoons, he will command,

Sections ! form Platoons—March !

They will form platoons, as they were before ; i. e. if the section breaks off from the left, they will form on the left ; if from the right, they will form on the right, by the oblique step. This should be performed with life.

SECTION III.

*Of RECEIVING and MANNING the PIECES,
at the PARK.*

ARTICLE I.

*The Position of the Men, to receive the Pieces
unlimbered.*

The pieces being placed on a line, at such distance from each other, that the wings of

each division will not interfere when the pieces are manned, march the men in front of the pieces, so as to have the pieces on their right. When the front platoons have gained the ground opposite the right flank of the pieces, they will keep their ground. The rear platoons of each division will stop at wheeling distance from the left flank of their respective pieces. When the whole have thus gained their proper ground, *command*,

Halt ! Dress ! To the right—Face ! By Files—March !

Great care must be taken, to keep the files closed. And when the rear files have gained the line of the Axletrees,

Halt ! To the left—Face !

The left hand man of each platoon should dress, so as to form a line, corresponding with the axletrees, by which the whole should be governed. If they are too open, they should close to the left.

By Platoons ! To the left—Wheel ! March !

They wheel to the left, and dress on a line with the axletrees.

ARTICLE

ARTICLE II.

Of Manning the Pieces.

Command,

Halt ! Man—Pieces !

In manning the pieces, great care should be taken, that each man understand and perform his duty, with regularity and alertness, in the following order: The Sergeants, being next to the pieces, will step back a little, in the rear, and take care, that every thing is in order for action, or exercise, agreeably to the direction of the Officer commanding the piece. One Gunner at each Piece handles the Trailspike, or Tiller; one the Linstock, and the other handles the Sponge and Rammer. The Bombardiers are placed, one at the Vent; one to serve the piece with Cartridges, and the other (with two or three other men to each piece, taken from about the centre of each platoon, whose duty should be previously assigned them) to take off the Sideboxes, and place them in the rear of the pieces, opening *from* the piece. In the mean time, the drag ropes should be taken from the breast transom hooks, and hooked to the washer hooks; and the Corporals should extend them in front of the men. The man, in each platoon, next the piece, should be expert in hooking
and

and unhooking the drag ropes. All the Matrosses, who are not otherwise employed, will attend at the drag ropes; the Corporals on the wings. The whole will dress in a line with the axletrees.

One Matross, at each piece, should be appointed to carry the *Haversack*, with Cartridges. He should be a trusty man, as his duty is important. His place is on the left of the piece. Some Officers place him in front of the drag rope, others in the rear. If I were to exercise my own judgment, in the case, I should place him in the rear of the drag rope, in such a position, as to hand the cartridge, with his right hand, to the Bombardier, who will receive it, with his left hand. When he has handed the cartridge, he may incline a little to the left; and must be very cautious, when the piece is fired, that the fire be not communicated to the cartridges in his haversack. I would not be so nice about his attending to particular motions, as to doing his duty with fidelity and alertness. He should face the front, holding his haversack under his left arm, the better to secure it from fire. The only material objection, to posting this man in the rear of the drag rope, is, that he will be in the way of the men when shifting the drag ropes: But, if he steps close to the wheel, when the drag ropes are shifting,
he

he will not be much in the way ; for the man, who hooks, may pass by him with ease ; but if he be in front, he will be in the way of advancing, and it will be attended with inconveniences, as it is sometimes necessary to load the pieces, while advancing. Besides if he is in the rear of the drag rope, he will, if necessary, more readily supply his haversack with cartridges, from the side boxes.

ARTICLE III.

Of Marching the Pieces from the Park, with Limbers and Horses.

The Company march by platoons, in front of the pieces, as in Article first.

Halt ! Limber—Pieces !

A Sergeant, to each piece, will take one or two men out of each platoon, as the case may require, who will turn the pieces, so as to have their trails towards the front of the Company, and fix them on the limbers. The Matrosses then take their places in the ranks. The Sergeants will see that the drivers bring the pieces to their places between the platoons of each division, and the tumbrel in the center. When the pieces have arrived on the right flank of their respective divisions, *command,*

Forward—

Forward—March !

The Officers will pay particular attention to their respective platoons, and see that suitable openings be made between the platoons, to receive the pieces. The first platoon advances, and the first piece will follow, inclining obliquely to the left, until it gains its proper ground in the rear of the center of the platoon. The second platoon follow on, in rear of the piece, then the tumbrel, unless the Company are to march at the head of a battalion of infantry ; in which case, the tumbrel will march in the rear of the Company, and carry a supply of musket cartridges, for the Infantry, if required.

The third and fourth platoons will form the second division, in the same manner as the first. The first and third platoons should march at least four paces in front of the horses' heads ; the like distance from the pieces should be observed, by the platoons which follow the pieces ; or a greater distance still must be observed, if necessary to give the horses more room ; for it is difficult to make horses (especially such as are unaccustomed to this kind of service) march uniformly with the men.

ARTICLE IV.

Of Marching, by Files, on the flanks of the Pieces.

Previously to unlimbering, it is necessary that the platoons march by files, on the flanks of their respective pieces. It is therefore requisite, that the men be often exercised in this way of marching, that they may be expert, and perform it with accuracy and alertness ; but the difficulty is, so to perform it, as to prevent shifting the platoons from right to left, or being in a reversed position. With deference to older and more experienced *Artillerists, I would propose the following method, which, I humbly conceive, will not be attended with either of the difficulties before mentioned.

*Caution.**Take care to March by files !*

At this word of caution, the Officers commanding platoons, will see that their men are dressed ; that the platoons are at suitable distances from the pieces ; that they
give

* Col. GRAVES directs, that the first and third platoons file off to the right, and, to prevent being in a reversed position, when the pieces are unlimbered, to hook their drag ropes on the left ; consequently, (the muzzle being the front) the right platoon is shifted to the left, and the left put in the place of the right ; which, I think, is as great, if not a greater evil, than the other.

give good attention to the commanding Officer, and are ready to attend to the following word of command,

Platoons ! by files—March !

At this word of command, the first and third, or front platoons of each division, will face to the left, all but the Sergeant, or left hand man, who will proceed, directly, in front ; the other, as they arrive on his ground, turn to the right, and follow him, in succession. When they have uncovered the ground, on which the piece is to march, they will march very slowly by shortening their step, until they cover the pieces, in flank. The second and fourth, or rear platoons in each division, will face to the right, except the Sergeant or right hand man, who will march directly forward on the right flank of the piece ; the other men follow, as before directed, only they will lengthen their step, and come up briskly until they cover the flanks of the pieces and the other platoons. The file leaders should not be further advanced than the trail transoms. The files should be closed.

ARTICLE V.

Of Unlimbering and Manning the Pieces,

Being arrived on the ground, on which you are to exercise. *Command,*

Halt !

*Halt ! towards Pieces—Face !
Unlimber Pieces !*

The men appointed to that duty will unlimber the pieces, and take their places as before.

Man—Pieces !
[As in Article II.]

The Corporals, who were the rear files, take the drag ropes from the breast transom hooks, and hook one end to the washer hooks, and by the other, extend them in a line with the axletree, by which the men *dress*. Those on the right of the front platoon of each division, and those on the left of the rear platoons, will wheel by stepping backward, as the ropes are extended. And the whole of the Matrosses, who man the drag ropes, will *dress* by them : If the exercise is not to begin immediately, they may be laid on the ground, in front of the men, and the men permitted to rest : Or thus, let the men file off as before, but let the files march, at wheeling distances, from the pieces ; and when the Company halt to unlimber, let the men be so far advanced, that the rear files be in a line with the axletree of the piece. The files being closed, let them face to the center, as before, and then *command*,

C

To

*To the right and left toward the center—
Wheel ! March !*

The front platoons of each division wheel to the right, and the rear platoons to the left ; i. e. the leading files of each will wheel towards their respective pieces, then *dress* in a line with the axletree. They will then unlimber and *man* the pieces, as described in Article II.

SECTION IV.

Of FORMING the LINE for ACTION, or EXERCISE.

CASE I.—*To Form a Line, fronting the right.*

This is done by a single evolution of wheeling. *Command,*

Pieces ! to the right—Wheel ! March !

The whole wheel to the right, form and dress in a line ; observing a suitable space between the pieces ; about four paces between the wings. The men who take care of the side boxes, will take them off the carriages, and carry them in the rear of the pieces, observing to place them so as to open from the piece. The men then face the front.

CASE

CASE II.—*To Form a Line for Action, facing the front.*

The second piece, being in front, may keep its station, if the ground will admit the other to form on the *right*; if not, it must wheel to the left, and march until it makes room for the other; in the mean time, the other piece will march obliquely, and form on the right of the second piece.

CASE III.—*To Form a Line, fronting the left.*

The first piece will wheel to the left, the second will wheel to the right, march round the rear of the first piece, and form on the left.

CASE IV.—*To Form a Line, fronting the rear of the Pieces.*

Both wheel to the right about; the second piece marches obliquely, and forms on the left of the first.

NOTE.—In each of the foregoing Cases, the pieces are considered to be as they were, when first unlimbered.

SECTION V.

Of the FIRINGS.

Caution.

Take care to go through with the Firings!

ARTICLE I.

Of Firing, in general.

The commanding Officer gives the signal for the drum to beat the preparative.

Charge—Pieces !

The Gunners and Bombardiers will proceed to charge the pieces briskly, yet, with great caution. In doing which, the following things should be attended to; viz.—1st. That the piece be well spunged, so as to extinguish all the fire, which may remain in the cylinder, or bore; for which purpose, the sponge should be turned twice round.—2d. The vent should be carefully tended, while the piece is spunged, and until the charge is driven home, so as to prevent any air from passing through it.—3d. In firing with *paper* cartridges, the worm must be applied, to draw out the bottom of the cartridge paper, lest it should stop the vent, and prevent the next charge taking fire.—4th. The man, who fires the piece, should be exceedingly cautious, lest he scatter fire among the cartridges, especially, if he uses port fire.—5th. The Bombardier, whose duty it is, must be careful, that the piece is properly served with cartridges; if flannel cartridges are used, covered with paper cylinders and caps, he must uncap them. The

The Bumbardier, who tends the vent, should carry the tube box, powder horn, and lint, or port fire stock ; also he should affix to his belt a priming wire and gimblet, in order to clear the vent, if it should be stopped ; he should be very careful to keep the vent closely stopped, until the charge is driven home ; and then, if he prime with loose powder, he must pierce the cartridge with the priming wire, and when he has primed, he must break the powder, by rolling the horn on the priming, that it may take fire the quicker. If he prime with tubes, he will uncap the tube, as he takes it out of the box, and place his right thumb on the bowl of the tube, holding it between his fingers, and then enter it into the vent, and crowd it down with his thumb. When the piece is primed, either with loose powder, or with tubes, he must cover the priming with the hollow of his left hand, to prevent its blowing off, or taking fire, until word is given *Fire !* when he will quit the piece, and incline one step to the right, so as to be clear of the carriage, if the piece recoils.

NOTE.—The firing begins on the right, and proceeds towards the left.

ARTICLE II.

Of Firing while advancing.

It may sometimes be necessary for the Artillery, annexed to a brigade, or in connection

tion with a larger or smaller portion of Infantry, to keep up a fire, *advancing*.

When advancing in a line with two or more pieces, though the men at the drag ropes cannot keep dressed in a line (being forward of the pieces) yet, the Officers, commanding pieces, should see that they advance, uniformly, so that the pieces move in the line of *March*! And in all marches, with pieces unlimbered, it should be observed, that the drag ropes do not interfere with the wheels. The limbers and tumbrel should move on, in their places. And the side boxes, containing suitable ammunition, should be carried by trusty men, attended by Bombardiers, who must see that the haversack are supplied with suitable cartridges. The Gunners, at the trail spikes, must keep the pieces in proper direction, according to the order of the Officers commanding the pieces. All which being observed, the Gunners and Bombardiers may proceed to load the pieces, *advancing*. When the pieces are ready to be fired, *command*,

Halt !

Let the Gunner direct the piece instantly.

Fire ! Advance !

Then proceed to charge, &c.

ARTICLE III.

Of Firing while retreating.

This requires great steadiness and caution.

Change—Drag Ropes !

"The men, who manage the drag ropes, will slacken them, so that they may be unhooked with ease. The men on the right drag rope face to the left about, at the same time, spring the rope over their heads with the right hand; those on the left, face to the right about, and throw the rope over with the left hand. Hook the ropes to the trail transom hooks." The man who carries the haversack will change sides of the drag ropes. When the piece is to be fired, command,

Halt ! Change—Drag Ropes !

The men at the right drag rope, being the left wing, while retreating, face to the right about, and throw over the rope, with the left hand; those on the left, being the right wing, as they are retreating, face to the left about, and throw over the rope with the right hand. In the mean while, the Gunner directs the piece.

Fire ! Change—Drag Ropes ! March !

Charge—Pieces !

The

The pieces must be charged *while retreating* ; and should be fired at the same time the Infantry fire, to prevent breaking the line.

When the exercise or action is over, if the Company are to march any considerable distance, it will be necessary to limber the pieces.

Caution.

Take care to limber Pieces !

The drivers must fetch the limbers, the horses' heads fronting the way the Company is to march.

Unbook—Drag Ropes !

The ropes are to be coiled on the breast transom hooks ; the side boxes put on.

Limber—Pieces !

The pieces are to be put on their limbers ; and the men form in front of the pieces, as in Section I, as they stood in the line and in the same order.

Platoons ! to the right—Wheel ! March !

They wheel to the right and dress, but keep their step on the ground, unless ordered to halt.

Forward

Forward—March !

The whole advance, opening spaces between the platoons, to make room for the pieces, which will fall obliquely into their proper places, as in Section III, Article III. But if a Company of Artillery be annexed to a battalion of Infantry, and the whole retreat, or march by the left in front, the platoons will wheel to the left. In this case the front platoon, although in the rear of the pieces, will file off to the left, in case it should be necessary to march by files on the flanks of the pieces.

SECTION VI.

Of the EVOLUTIONS.

ARTICLE I.

*Of advancing the Right in front.**Pieces advance—By the right ! the
right in front !*

The front piece advances directly forward. The rear piece marches obliquely to the right, until it gains the rear of the front piece, in which order they will continue their march, observing a proper distance.

ARTICLE:

ARTICLE II.

Of displaying pieces to the left.

*Take care to display pieces to the left ;
March !*

“The rear pieces march obliquely and come up with life and dress in a line on the left.” Or, if it be more convenient, the line may be formed, by the whole wheeling to the left. But, if necessitated by a sudden attack, to form the line fronting the right, *command,*

*Pieces to the right—Wheel ! Form a line !
March !*

They wheel and form the line with the rear piece on the right. And when it is expedient to change the front of the line, *command,*

*Pieces ! to the right about—Wheel !
March !*

The pieces wheel respectively to the right about, on their own ground. The tumbrils pass through between the divisions, and the line is formed as before. Or the following method may be as proper—

Pieces

Pieces ! to the left—Wheel ! March !

They wheel to the left and dress, covering each other.

*Take care to display pieces to the left !
March !*

The rear piece or pieces display, and form the line as above described, if the company or battalion are advancing ; but if the front piece is halted, the rear piece or pieces may wheel to the left, and march till they unmask themselves ; then wheel to the right, and march to their station in the line.

ARTICLE III.

*Pieces advance by the left ! the left in
front ! March !*

The right piece marches obliquely, and falls into the rear of the left.

ARTICLE IV.

*Take care to display pieces to the right !
March !*

Oblique to the right ; and form the line as before.

ARTICLE

ARTICLE V.

Of Wheeling with the Pieces.

*Company ! to the right—Wheel !
March !*

The right piece forms a pivot on which to wheel. The matrosses at the drag rope, on the right flank, step backward ; the left piece comes up with life, by enlarging their step in proportion to their distance from their Pivot. The whole will dress by the left wing till the wheel is performed, when they will form the line and dress by the right.

Halt ! Dress !

They dress from right to left.

Company ! to the left—Wheel ! March !

This is done as the other, only the left piece forms the Pivot on which to wheel.

Halt ! Dress !

NOTE.—Some Artillery Officers direct, to dress by the right Piece, when the company is wheeling to the right ; but it appears to me improper ; for, as the line ought to be kept entire in wheeling, without breaking,
it

it is necessary they should be governed, in advancing, by the wing which wheels; otherwise, those nearest the Pivot would be apt to wheel too fast, and cause a breach, as the men would not keep dressed.

SECTION V.

Of Review and Inspection.

ARTICLE I.

Of Review.

The battalion being drawn up for review and inspection; the Companies placed according to seniority of their respective Captains. The pieces should be placed as for action; observing to keep suitable distances between the Companies. The tumbrels and limbers dressed in a line, about eight paces in the rear of the pieces; tumbrels behind the center of their respective Companies; the limbers in the rear of their pieces; the horses facing toward the front; the men, with the side boxes, a little to the left of their respective pieces, four paces in the rear of the trail transom; the Sergeants will dress in a line with the side boxes, and cover the commissioned Officers, who will dress in a line advanced four paces in front of the pieces. If commanded by a Major only, he will post himself in the center of the

D

battalion

battalion, a little advanced of the line of Officers. The Adjutant in the rear. When the General enters the field for review; just as he arrives at the right of the battalion, *Salute*, by distinctly firing two pieces on the right of the battalion. The Officers will salute him, with their Swords, as he passes.

If the battalion is to *march* in review, the commanding Officer will order,

Battalion ! take care to Limber Pieces !

The commanding Officers of Companies will give the necessary orders to their respective Companies, and see that the pieces are immediately limbered, fronting to the right—drag ropes done up—the side boxes and other apparatus secured. The men will immediately parade, each Company in front of the pieces as they were when unlimbered, and will dress in a line, through the whole battalion, and draw their Swords.

Attention !

*Battalion ! by Platoons ! to the right—
Wheel ! March !*

The whole wheel by platoons as in the Company exercise.

Forward—March !

The march will begin at the right, the pieces and other platoons follow in succession,

sion, observing to keep greater distance between the Companies, than between the pieces in each Company; they wheel and salute the General, marching; each Officer will salute as he passes the General, and will give the word to his respective platoon,

Present—Sword!

Previous to arriving on the ground from which they set out; the command being given, they will march by files on the flanks of the pieces. When they arrive on the ground, they halt, unlimber and man the pieces, as before described.

ARTICLE II.

Of Inspection.

When the battalion are to be inspected, the pieces should be completely manned, and their apparatus in the best order.

To prepare for inspection, the commanding Officer orders,

Attention!

*Battalion! by Companies! to the right—
Wheel! March!*

When the Companies wheel, the tumbrils, and limbers, and men with the file boxes, will wheel

wheel and dress in the rear of their respective Companies.

NOTE.—Let it always be observed, if the pieces are manned, that, when the command is given, *to wheel to the right*, the drivers will turn their horses to the left; if *to the left*, turn the horses to the right. If the pieces advance, the tumbrel and limbers advance, keeping the same distance. If the command is *to charge drag ropes*, the horses wheel about. If the pieces retreat, the horses retreat before them.

Being thus prepared, the inspection begins on the right of the battalion. The other Companies may rest, but not leave their places; and when the inspector approaches, *command*,

Attention!

The review and inspection of a Company of Artillery, annexed to a Regiment of Infantry, is the same as above described; only, they receive their orders from the Officer commanding the Regiment; but the Captain, or commanding Officer of the Artillery, will give the necessary words of command to his Company.

CHAPTER

CHAPTER II.

An EASY and EXACT Method of finding the LINES of DIRECTION and ELEVATION of a GUN, so as to ascertain and mark them on the base ring, and on the swelling of the muzzle, corresponding with the center of the bore.

SECTION I.

Of the LINE of DIRECTION.

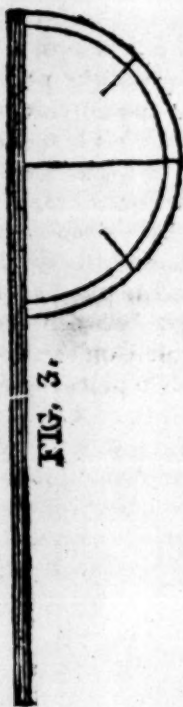
PERHAPS no piece of ordnance can be found, whose bore exactly corresponds with the out side of the piece; therefore, if the Gunner, in taking his direction, has regard only to the out side of the piece, without noticing the variation between that and the bore, he will be deceived in his observation, and miss his object. To ascertain such line of direction, let the following things be carefully attended to:

1st. Let the wheels be so placed, that the under side of the axletree shall be exactly horizontal. In order to ascertain this point, fix a plumb rule between the tire axis and breast transom, so as to be perpendicular when the piece is unlimbered, and at right angles.

angles with the under side of the axletree ; and by the plumb line you may know when the wheels are level.—2dly. Insert a line, made of strong twine, into and through the center of the bore, by an instrument made for that purpose, in the following manner : [See Plate I. Fig. 1.] Take two straight square staves, [A A] whose sides are three fourths of an inch, their length about double that of the bore of the gun ; then take two circular pieces, or wheels of firm timber one inch thick, [b b] let them be made exactly round, so as just to fit the bore of the gun ; mark two diametrical lines, intersecting each other at right angles ; on each wheel, one of these lines, or marks, I shall denominate *horizontal*, the other, *perpendicular* ; on each horizontal line, at equal distances from the center of the wheels, and about half an inch apart, make two mortises, or holes, so as to just receive the staves ; fasten one end of each staff into one of the wheels, taking care that the centers of the staves correspond with the horizontal line ; fasten one end of the twine line [c c] in the center of the wheel ; then, by help of the staves, introduce the wheel and line to the bottom of the bore ; make a hole one fourth of an inch diameter through the center of the other wheel, through which draw the other end of the twine line ; put the other or outward ends of the staves through the mortises in
the

the wheel, and slip the wheel just into the mouth of the bore, so as to be even with the muzzle of the gun; then fix the ends of the slaves into a small oblong piece of wood, [b b] at the same distance as in the wheels, through which piece, make a small hole equidistant from the center of each staff, through which draw the twine, straighten and fasten it with a screw or pin; fix the wheels so that the perpendicular line on the wheel at the muzzle may be exact with the plumb line. Then take two other slaves [m m] of like bigness with, but rather longer than the former ones, fasten the ends of them into oblong pieces of wood, [u u] and [o o] the same distance apart as the former, draw a twine line [p] through those pieces in the center between the slaves; [See Fig. 2.] place them on the upper and out side of the gun; then place the outer ends of both pair of slaves, so that their lines will exactly range with each other, and with the perpendicular line or stroke on the wheel at the muzzle. The line between the slaves on the upper, out side of the gun, is the line of direction required. Then mark with a chisel, or file, where the line intersects the base ring, and the swelling of the muzzle.

EXPLANATION.



EXPLANATION OF PLATE I.

FIGURE 1, is an instrument made to slip into the bore of the gun, so as to insert a line in and through the center of the bore. (A A) are two straight square staves whose sides are three fourths of an inch, their length double that of the bore of the gun ; (b b) are round wheels or trundles one inch thick, their diameters equal that of the bore of the gun, through which the staves are fixed ; (d d) is an oblong piece of wood placed on one end of the staves ; (c c) a twine line drawn through the center of the wheels or trundles and fastened into the oblong piece.

Figure 2, is an instrument made to lay on the top and out side of the gun, so as to correspond with that in the bore ; (m m) are two other staves of equal bigness, but longer than the former ones ; (n n) and (o o) are two oblong pieces of wood affixed to the end of the staves ; (p) is a twine line fastened to the oblong pieces in the center between the staves.

Figure 3, is a cimeter fixed to the end of a staff to slip into the bore of the gun to ascertain the elevation.

SECTION

SECTION II.

Of the LINE of ELEVATION.

To make the side lines, which are necessary to ascertain a proper elevation, turn the instrument in the bore so that the line, which before was perpendicular, shall be horizontal; affix a rule, about the length of the diameter of the swelling of the muzzle, to the oblong piece on the end of the staves, and at right angles with the oblong; the center of the rule being on the screw or pin that fastens the line in the oblong piece; then affix two lines, one on each side of the gun, fasten one end of each line, to the end of the rule on the same side; let the lines be extended to the base ring, so as just to touch the tops of the trunnions, and to correspond with the line inserted through the center of the bore; then, mark your lines of elevation where these lines intersect the base ring and the swelling of the muzzle. If the trunnion plates interfere with the marked lines, and the plates cannot be cut or filed, so as not to obstruct the sight; then raise the lines so as to be clear of the plates.

NOTE.

NOTE.—These lines of direction and elevation are of great use to the Gunner, if the piece stands level ; but if not nearly level, they will be of little consequence. Therefore, the axis of the carriage ought to be placed as level as possible.

CHAPTER

CHAPTER III.

*Of FINDING the DISTANCE of an
OBJECT.*

THERE are various ways of measuring distances. But so many difficulties attend the nice, exact and expeditious application of the usual methods, that they are of but little use in experimental gunnery.

I would propose the following method, as being concise, and easily performed, and more applicable and useful in gunnery, than any I have yet seen.—The gunner must be furnished with a chain, ten yards in length; and an instrument of the following description; viz.—[See Plate II.] A circular table or plate of brass, 12 inches in diameter, so constructed, with a socket and ball fixed to the under side, that being set on a staff, it may be put into any position, whether horizontal or perpendicular, similar to a Surveyor's compass. Let the circle be divided into four equal parts, and the degrees and minutes marked on the periphery; fix immoveable sights at (A A) as in a Surveyor's compass, (See Fig.) fit a moveable index, by a pin going through the middle of it, and through the center of the plate at (C)
so

so as to point to any degree on the periphery. Near the ends of the index fix sights like those at A A; let a *Table of Distances* be engraven on the face of the plate, as in the figure. The numbers, 20, 30, 40, 50, 60, at the top, and bottom of the table, are the distance, or off set, measured with the chain, in order to ascertain the distance of an object aimed at in firing. The table is divided into two parts, in order to fit the face of the instrument. In the outer columns are marked the degrees, $1^{\circ} 2^{\circ} 3^{\circ}$ &c. to 11° in the next columns are marked the minutes, $5' 10' 15'$ &c. noticing every 5th minute of the degree.

To ascertain the distance of any object, as of D from O, in the triangle D F O, place your instrument at D, so that you can see the object at O, through the immoveable sights A A. Set the moveable index at right angles with the line of the immoveable sights A A; i. e. at 0 on the line of degrees; look through the sights on the index, and observe some object, in a straight line, toward which, measure with the chain as far as you choose,

E



(suppose

(suppose to F, 50 yards) and at the end of the measured line, set up a stake or staff, taking care, by looking through the sights on the moveable index of the instrument, that the stake or staff be set exactly in the line. Then, having set another staff at D, exactly where the instrument stood; move the instrument to F and set it exactly where the first mentioned staff or stake stood; fix the instrument so as to see the staff at D through the immoveable sights; then, turn the index so as to see the object at O, through the sights, on the index; notice the degree and minute, to which the index points.— Suppose it be $6^{\circ} 15'$; then in the table of distances look for 50, at the top (being the measured distance from D to F) and under it, and against $6^{\circ} 15'$ in the outer column, you will find 457 the distance of the object, or the length of the line D, O.

NOTE.—The angle, found by the instrument, is the angle which the measured line subtends at the object, whose distance is required. The measured line being always at right angles with the line of the object; therefore, the line to the object, whose distance is required, will be the *base*, and the measured line will be the *perpendicular* of a right angled triangle. From these data, viz. (the perpendicular and the angle at the object)

ject being given) it is easy to calculate the exact distance of any object (i. e. the length of the base) although it be not contained in the table of distances. This may be done by either of the following *propositions*, in which P. stands for *perpendicular*, B. for *base*, or the distance required, S. for *sine*, S. co. for *sine complement*, T. for *tangent*, and T. co. for *tangent complement*, of the given angle.

1st. $S : P :: S. co. : B$

2d. $Radius : T. co. :: P : B.$

3d. $T. : Radius :: P : B.$

The foregoing CASES illustrated by EXAMPLE.

CASE I.

The Sine of $6^{\circ} 15'$	-	-	is	9.016898
Logarithm of Perpendicular 30	-	-	-	1.698970
Sine Complement,	-	-	-	9.997411
Sum of the two last,	-	-	-	11.696381
From which sum subtract the first number or Sine of the $6^{\circ} 15'$ and there remains,	-	-	-	2.659485
Being the Logarithm of the length of the line D O; the nearest number answering thereto is 457, the distance required.	-	-	-	

CASE II.

Radius	-	-	is	10.000000
Tangent Complement of $6^{\circ} 15'$	-	-	-	10.960513
Logarithm of the Perpendicular 30	-	-	-	1.698970
The two last added together,	-	-	make	12.659483
Subtract the first term and there remains,	-	-	-	2.659485
	-	-	-	Which

Which is the Logarithm of 457, the distance required on the length of the line D O.

CASE III.

Tangent of $6^{\circ} 15'$	-	-	is	<u>9.039485</u>
Radius,	-	-	-	10.000000
Perpendicular 50	-	-	-	<u>1.698970</u>
Sum of the Radius and Perpendicular,	-	-	-	<u>11.698970</u>
Subtract the first term,			Remains	2.659485
Answering to 457, the distance as before found.				

If it be required to measure a distance greater than is contained in the Table, it will be proper (if the ground will admit) to make a larger off-set, or longer perpendicular line, which suppose 100 yards, and that the angle at the object, whose distance is sought, be one degree and thirty minutes, then state your terms and work as in either of the foregoing Cases. See the Example by Case III.

As the Tangent of the angle $1^{\circ} 30'$ is to Radius, so is the Logarithm of the Perpendicular 100 to the Logarithm of the Base, or distance required.

Tangent of $1^{\circ} 30'$	-	-	is	<u>8.418068</u>
Radius,	-	-	-	10.000000
Logarithm of Perpendicular 100	-	-	-	<u>2.000000</u>
Sum of the two last terms,	-	-	-	<u>12.000000</u>
After subtracting the former, there remains				3.581932
The nearest number answering to which is 3819, the distance required.				

CHAPTER IV.

OBSERVATIONS on EXPERIMENTAL
GUNNERY.

THIS part of the duty of the Artillerist depends much on the judgment of the Gunner, or whoever directs the piece. Perhaps no rules can be given which will exactly apply in all cases, when firing with light field pieces, especially in action. Nevertheless, I think it important that some practical directions be attended to, by which the Gunner may be assisted in forming a better judgment in directing the piece in time of action. But it is more especially necessary, that the Artillerist be acquainted with the particular rules of gunnery, that he may be better fitted to do garrison duty, if required. I shall therefore offer a few brief hints on this subject :

1st. The line of direction and side lines, being ascertained and marked on the piece as directed in Chapter II, see that the axis of the carriage is horizontal.

2d. Let the powder be well mixed, so that it shall all be of equal strength ; and it should be measured exactly so that an equal quantity be put into each cartridge, one fifth part of the weight of the shot may be sufficient.

3d. The

3d. The balls should be of equal weight, and suited to the caliber of the piece.

4th. Ascertain the distance of your object or mark aimed at, as described in Chapter III. [About 400 yards will be a suitable distance for a three pounder.]

5th. See whether your object be above or below a horizontal line. To effect this, turn your instrument so that the face of the plate or table will be perpendicular; then, by a plumb line, set the fixed sights exactly perpendicular; observe your object through the sights on the moveable index, and notice the degree the index stands at, above, or below a horizontal line, or O.

6th. Direct your piece towards the object by the line of direction on the top of the piece; observe your elevation by the side lines; then, by your quadrant or semicircle, fixed to a staff, as in Plate I. Fig. 3. take the degree of elevation; observe whether the ball goes over or falls short of the object; [it is adviseable always so to elevate, that the first shot may fall short of the object] and note in a table, for that purpose, the variations as near as may be. If it falls short of the object, elevate your piece a little, if it goes over, depress it according to your best judgment, and try another shot, and so proceed till you hit the object. Noting down in a table the distances, the elevations,

tions, the variation from a horizontal line, if any, whether above or below.

It is not consistent with my present design to enter into a minute account of "the velocity of shots and shells ; for this cannot be determined without being acquainted with the laws of resistance, which cannot be known without the use of *fluxions*, nor of describing the curve of the shot, which is one of the most intricate cases ;" but only to give some practical directions, which may serve to assist the Gunner in making a better judgment.

A TABLE

A TABLE OF PRACTICE IN EXPERIMENTAL GUNNERY.

Proof of Powder—One ounce produced a range of — yards, at an elevation of 12 degrees—Distance of the object 375 yards.

Wt. of the Shot.	Wt. of Powd.		Angle of elevation.		Variation of the object from the horizontal line.				Balls variation from the object.				Horizontal range.
					above		below		be.	bel.	r't.	left	
lb.	lb.	oz.	d.	m.	d.	m.	d.	m.	yds.	yds.	yds.	yds.	yds.
3	1		1	30	1	30				3	1		300
3	1	2	2	5					2			1 1/2	400
4	1	6	1						1		2		400
4	1	4	1						1		2		400
6	1	10		30					1				410

NOTE. The examples in this table are not taken from any experiments in practice, nor calculated from any rules in theory; but are merely ideal and serve only to shew how examples of practice should be noted down in the table.

FINIS.

Briggs

a Table of Practical
Quinn -

Isaac Briggs

~~Isaac Briggs~~

~~Isaac Briggs~~